The Case for High-Quality CTE

By James R. Stone III

After years of languishing as the program for someone else's child, career and technical education (CTE) has been rediscovered by federal, state, and local policymakers. This renewed interest comes at a time when federal policy, beginning with the 1983 report *A Nation at Risk*, has had the effect of turning high school into the new middle school—a point in the education pipeline with no intrinsic value other than preparation for the next level of education, presumably college. This is unfortunate, especially for the sizable percentage of youth who will neither graduate from high school nor successfully matriculate into and complete formal postsecondary education.

A Nation at Risk has been followed by more than 30 years of claims that the American education system is failing its children. Ironically, the generation of children put at risk by "a rising tide of mediocrity" (as boldly trumpeted in the report)[1] moved into the labor market in the 1990s and helped generate the longest sustained economic boom in our history. And the report's concerns about our economic competitiveness arose in the context of fears about Japanese and German companies outperforming American companies, due in large part to the superior quality of their education systems. Today, those concerns typically reflect competition from China as well as other countries where workers are paid little and have little voice. I don't think too many Americans would trade our education system for theirs.

Nonetheless, assumptions about the demise of U.S. economic competitiveness remain connected to education. The U.S. economy, in 2009, did lose its spot as the most competitive in the world, and it has continued to fall in rank ever since. However, the factors identified with this decline have little to do with education. Although education is a contributing factor, more relevant factors include labor-employer relations, flexibility of wage determination, the participation of women in the workforce, infrastructure issues, and worker health.[2]

Despite evidence to the contrary, global competitiveness arguments continue to be used as a means of promoting a strictly academic curriculum in high school—one designed solely to prepare students to pursue a four-year college degree—as the best and only educational option. This college-for-all mentality has had the pernicious effect of diminishing the presence of high school CTE.*

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*For more about the college-for-all mentality, see "Beyond One-Size-Fits-All College Dreams" in the Fall 2010 issue of *American Educator*, available at www.aft.org/pdfs/americaneducator/fall2010/Rosenbaum.pdf.

ILLUSTRATIONS BY INGO FAST

The Emerging Labor Market: The Raison d'Être for CTE

Career and technical education is the part of American high school that provides the link between the needs of the labor market and the needs of young people to be fully prepared to move into the workforce or continue their career-focused education and training beyond high school. Concerns about how to strengthen our economy, as well as complaints from employers that too many students graduate from college without the knowledge and skills needed to fill jobs, have sparked a renewed interest in CTE.

CTE repeatedly surfaces in discussions of "college and career readiness"—a phrase, much in use these days, that implies "college ready" and "career ready" are one and the same. The evidence contradicts the rhetoric, however. Both testing and labor-market experts argue that being prepared for college is not the same as being prepared for a successful transition into the workforce.[3] Indeed, conflating college readiness and career readiness fails to accommodate the varied nature of the workplace and the different kinds of academic preparation required for successful entry. Put another way, the mathematics skills required for entry into an engineering career pathway are different from those required for a social services career pathway or a business career pathway.

Despite the rhetoric around college and career readiness, there is general consensus that equipping all young people with the knowledge and skills to become productive adults is the implicit goal of public education. CTE, with its emphasis on providing the background knowledge and tangible skills crucial to career preparation, is now recognized as opening multiple pathways to reach that goal. Pathways will differ, of course, for each student, but all pathways should facilitate the ultimate transition into the labor market.

Keeping Tabs on the Labor Market

Over the next 10 years, between one-quarter and slightly more than one-third of expected job openings will require at least a four-year university degree for initial entry. At the opposite end of the spectrum, between 36 percent and 59 percent of job openings will require only a high school credential. The remainder of expected openings will require some level of postsecondary education, such as a community college degree, a diploma, a certificate, or another form of formal or nonformal education or training.[4] This part of the labor market is often referred to as "middle-skill occupations," and many provide robust career possibilities (e.g., registered nurses, apprenticeships, advanced manufacturing jobs, and technicians of various kinds).[5] For the many youth who do not envision a traditional four-year college experience, middle-skill occupations represent viable career pathways.

Areas of job growth also reflect trends in technology.[6] Historically, technology has eliminated the need for some jobs, while also creating new jobs requiring different kinds of skills. This may soon change, however, now that machines are increasingly able to do work that once required human intervention. From self-checkout systems in grocery stores to self-piloting drones to the ATM card, advances in technology are removing the human element from certain types of work.[7]

Despite this uneasiness about the impact of new technology on jobs, there is general agreement on the importance of certain skills in the emerging labor market. My colleague Morgan Lewis and I have defined these skills as the occupational expression of academic learning: academic skills sufficient to enter related, formal postsecondary education (without the need for remediation) and employment training pathways (e.g., apprenticeships); occupational or generalizable employability skills; and technical skills.[8] We believe that each domain of knowledge and skills must be part of a world-class curriculum to prepare youth for careers and continuing education beyond high school.

CTE provides the link between the needs of the labor market and the needs of young people to be prepared to move into the workforce or continue their education beyond high school.

The Academic Skills Employers Seek

The workplace requires varying levels of knowledge of mathematics, science, and literacy beyond those necessary for successful high school completion. For example, oral literacy skills are considered paramount for students pursuing business careers,[9] and potential engineers and workers in advanced manufacturing will most certainly require higher levels of math skills than those pursuing careers in the arts.

Despite the recognized variability, we need to identify a baseline or benchmark that will define what skills all future workforce participants will need to master—and in recent years, there have been efforts toward that end. In the early 1990s, a report by the Secretary's Commission on Achieving Necessary Skills (SCANS) listed academic skills in reading, writing, arithmetic/mathematics, listening, and speaking as basic skills that all workers need.[10] In 1999, the Conference Board (an independent group that provides economic data and research) determined that prose and informational literacy are critical for all workers.[11] In 2002, the Partnership for 21st Century Skills presented a literacy framework for information and communication technologies for all workers.[12]

Similarly, ACT has defined career readiness in terms of a cut score on its widely used college-readiness exam. For example, the organization states that a score of 22 for math is necessary for college and career readiness.[13] Recent research, however, shows that students can achieve an ACT score of 22 by mastering only middle school math, Algebra I, and a few concepts from geometry.[14]

The National Center on Education and the Economy analyzed the math requirements for first-year community college students and found only one program that required Algebra II; most relied heavily on math learned in middle school, especially arithmetic, ratios, proportions, expressions, and simple equations. In this same study, the authors found that the reading skills students needed to succeed in community college were at the 11th- and 12th-grade levels.[15]

While mathematics has received much attention, it is clear from this report that reading is indeed fundamental. The poor reading and communication skills that characterize today's high school graduates may explain the difficulty young people face in gaining traction in the labor market—a problem more pronounced for young men, who lag behind their female counterparts in reading and communication skills.[16]

Industry-recognized credentials are milestones that mark the developmental growth of an individual.

The Occupational Skills Employers Seek

Beyond cognitive skills, employers look for employees with a broad set of traits and skills that fall roughly into two groups. The first concerns employability or work readiness. These skills are necessary for obtaining and holding a job and succeeding in the workplace. From the simple ability to communicate with a potential employer to navigating relationship challenges in the workplace, such skills are often the most highly ranked in employer surveys.

Many colleges, however, do not ensure that students acquire these skills. One survey of employers, for example, found that recent college graduates lack basic workplace proficiencies like adaptability, communication skills, and the ability to work in groups and solve complex problems.[17] The National Association of Manufacturers reports that its members are most in need of employees with strong basic employability skills (such as timeliness and work ethic) and strong technical, team, literacy, and computer skills.[18]

A second group of skills can be classified as character traits.[19] Drawing on research from economics, psychology, neurobiology, and other fields, the argument follows that noncognitive skills, such as persistence, dependability, self-control, curiosity, conscientiousness, grit, and self-confidence, may be more crucial than sheer brainpower to achieving success in the workplace, college, and life.

The combination of these various employability and noncognitive skills may be partially developed in traditional classrooms, especially through project-based learning. But learning in nonclassroom settings, such as work-based learning and out-of-classroom experiences, may better help students develop these skills—and engage those who need to see a more concrete connection between schoolwork and their aspirations but cannot find it in the conventional academic curriculum.

The Technical Skills Employers Seek

Acquiring skills unique to different work environments enhances employability. In certain fields, the most powerful signal of an individual's career readiness is an industry-recognized credential. Beyond educational credentials, industry-recognized credentials indicate to the labor market that an individual possesses a specific set of skills desired by an employer.

A systems approach to robust career pathways would nest industry-recognized credentials in traditional academic degrees, providing for a series of stackable credentials that offer individuals a variety of pathways to future success. Pathways built on stackable credentials are showing up in manufacturing and energy,[20] and states such as Ohio and Pennsylvania have established credential-based pathways that can begin with apprenticeships or industry-based training and lead to applied baccalaureate degrees.[21] These credentials are milestones that mark the developmental growth of an individual, from general work-readiness credentials (e.g., ACT's National Career Readiness Certificate) to credentials for mastering entry-level and more advanced skills.

Understanding CTE's "Fit" in Education Today

To understand how CTE fits into American education today, one needs to look at its history. The CTE programs that currently exist are the culmination of multiple streams of education philosophy, some of which date back to colonial America.

Historically in this country, preparing young people to assume roles as productive adults began with apprenticeships. These programs were often targeted to children of the poor, usually to ensure they would develop what today we call "labor-market skills." It is well known that, as a boy of 12, Benjamin Franklin was a printer's apprentice. Less well known is that other historical figures were also apprentices, such as Alexander Hamilton, who apprenticed as a mercantile clerk, Paul Revere, who apprenticed as a silver smith, and many others. While apprenticeships survive today, they produce relatively few skilled workers. Often, apprenticeships are available only to adults and are limited to specific craft industries, such as construction and manufacturing. However, apprenticeships can be established in almost any area if an employer or union seeks to sponsor them.

A second stream of education philosophy influencing today's CTE was the manual training movement. It was based on the belief that intellectual learning was best supported with hands-on learning, a philosophy of John Dewey himself. The movement led to what was once known as industrial arts classes in American middle and high schools. These classes morphed into technology education classes over time. While vocational in some aspects, the curriculum was less directly connected to specific labor-market needs, in contrast to traditional vocational education.

CTE in today's schools originates from the 1862 Morrill Land-Grant Colleges Act, which inserted the federal government into the provision of technical education for young men to learn the practical agricultural and mechanical arts while also devoting time to "the higher graces" of classical studies, as the author of the act, Congressman Justin Morrill, put it.

It is also useful to know the context of the time to understand the further evolution of vocational education. The 1917 Smith-Hughes Act introduced the idea that the federal government has a role to play in secondary education. The act was passed during a time when scientific principles were being applied to social sciences and when social efficiency was the operational paradigm paralleling the rise of scientific management (à la Frederick Taylor) in the ever-expanding manufacturing economy. In contrast to Dewey, education leaders like David Snedden, Charles Prosser, and John Franklin Bobbitt argued that schools should assign children to specialized curricular tracks on the basis of assessments of their intellectual abilities (tests), which, they thought, would predict an individual's ultimate destiny in life. To determine students' appropriate tracks, one only needed to know their ultimate destinies—that is, the few should be educated for leadership and the others prepared to be "fit for useful employment."[22]

Fewer students are accessing CTE coursework today. One could argue that increased requirements for academic course-taking have squeezed out the curriculum space necessary for CTE.

The social efficiency approach to vocational education was uncontested through numerous amendments to the Smith-Hughes Act until the 1950s. In 1957, however, the Soviet Union launched Sputnik, which in turn led to our first STEM (science, technology, engineering, and mathematics) crisis and triggered a federal response, the National Defense Education Act (NDEA), whose authors argued that our public schools and colleges were doing an inadequate job teaching math and science.

There are other striking parallels to the past, such as the myopic focus on testing, but most germane to this conversation is the pushback that came in the 1960s and the years that followed. In 1962, four years after the passage of the NDEA, the business community expressed concern about the overemphasis on science to the detriment of other aspects of public education, such as preparing youth to become productive workers in the labor market, generating economic growth. An advisory panel reported these concerns to President Kennedy, which led to the 1963 Vocational Education Act, the largest single federal investment in high school in U.S. history. This law expanded both the breadth of vocational education through a substantial increase in funding and its reach to a wider range of students through the expansion of program offerings (e.g., distributive education and occupational home economics).

However, subsequent amendments in 1968 that emphasized a focus on the "hard to reach and the hard to teach,"[23] along with a requirement to create new programs for the disadvantaged—while well-intentioned—had the effect of shifting the focus of vocational education toward youth who traditionally did not do well in school. While not the only factor, one could argue that this contributed to a public perception of vocational education as something less than desirable for mainstream students.

In the 1970s and 1980s, as the country saw its position in the global marketplace slipping, Congress again looked to strengthen vocational education as a way to bolster worker preparation and economic activity. In 1976, amendments focused on gender equality in a half-hearted attempt to attract female students, long underrepresented in such programs. And in 1984, Congress passed the Carl D. Perkins Vocational Education Act, named after a congressman who was a longtime champion of vocational education. The Perkins Act further amended the 1963 Vocational Education Act and emphasized improving the skills of the labor market.

In 1990, Congress passed a more extensive revision of the vocational legislation. Influenced by a growing criticism of American education (e.g., *A Nation at Risk*), the revised Perkins Act introduced new requirements for curriculum integration, articulation between secondary and postsecondary CTE programs (Tech-Prep), and greater business and industry involvement in CTE. This was a dramatic departure from the historic approach to CTE as a narrowly focused employment-preparation program. Instead, the revised law emphasized CTE's connection to academic education and learning beyond high school and recognized it as necessary to prepare the workforce of the future. This act defined CTE as part of an integrated system that included:

- Horizontal integration of academic and occupational education within high schools;
- Vertical integration between secondary and postsecondary education programs; and
- Strong connections, in the form of partnerships, with business and industry.

Despite the potential of CTE to contribute to the nation's economy and to individual development, and despite the important role of CTE in college and career readiness, enrollments in CTE have declined in the past 20 years. While about 85 percent of all high school students take at least one CTE course, less than 20 percent take enough courses to be considered "concentrators" in CTE.[24] Within this decline, some program areas—such as healthcare, communications and design, and culinary arts—have shown increases in enrollment, but overall, fewer high school students are accessing CTE coursework today. One could make the argument that increased requirements for academic course-taking have squeezed out the curriculum space necessary for CTE courses.

Today's Approach to CTE

Many policymakers are striving to ensure that all students (1) graduate from high school, and (2) do so with the skills necessary to be "college and career ready." Hence, a major bipartisan focus of federal funding for career and technical education is for schools to work with parents, students, and postsecondary institutions to create coherent career preparation pathways. These are most often referred to as Programs of Study, or POS. Under the 2006 Perkins reauthorization, all school districts that receive Perkins funding must offer POS that:

1. Incorporate secondary education and postsecondary education elements.
2. Include coherent and rigorous content aligned with challenging academic standards and relevant career and technical content in a coordinated, nonduplicative progression of courses that align secondary education with postsecondary education.
3. Offer opportunities, where appropriate, for secondary education students to gain postsecondary education credits through dual or concurrent enrollment programs or other means.
4. Lead to an industry-recognized credential or certificate at the postsecondary level or an associate's or bachelor's degree.

A successful career pathway system that serves the needs of many, if not all, students requires supportive state policies and a well-articulated system. Such a system must bring together key institutions in effective partnerships grounded in extensive and intensive career development staffed by knowledgeable and effective educators who teach a world-class technical curriculum. If we assume the Common Core State Standards will continue to shape the traditional core academic subjects, what is the role of career and technical education curriculum in preparing youth for careers and continued learning beyond high school?

Public education's response to this conceptualization of college and career readiness has been the development of the career clusters and career pathways framework, led by the National Association of State Directors of Career Technical Education Consortium. This framework identifies the coursework necessary to support each career cluster and pathway.[25] What is missing from the framework—and many other course-based frameworks—is an explicit focus on the noncognitive employability skills and, often, the technical skills necessary for successful transitions to careers and college.

Delivering CTE in Today's High Schools

American secondary education is delivered through traditional comprehensive high schools, regional career-tech centers, and special-focus high schools. Within these delivery systems, approximately 94 percent of traditional high schools offer some CTE, 100 percent of the regional centers do so (as one might expect), and 55 percent of specialty high schools do so.[26]

The majority of adolescents attend regular or traditional high schools in the United States. These schools offer a broad array of programming in academics, the arts, and CTE (for examples of such programs in New York City, see the article on page 30). Then there are regional centers, which increasingly blend academics and technical education in ways that offer students clear pathways to meaningful work and continued education. Successful models are full day and feature academic specialists who may directly teach academic content where appropriate or work with technical educators to embed academics into technical lessons. The successes of schools like Blackstone Valley Regional Vocational Technical High School in Massachusetts provide evidence of the power of this approach.

Shared-time centers achieve similar ends. For example, Cass Career Center is a regional technical center that serves 12 traditional high schools in Harrisonville, Missouri. At Cass, content specialists in mathematics and English teach academic content in the technical classes. To develop this academic content, the content specialists at Cass meet with their counterparts in the 12 high schools and work with these instructors to develop a separate curriculum that Cass content specialists can fit into its technical curriculum. The CTE teachers at Cass then reinforce the academic content in their technical classes. Technical teachers partner in the delivery of the academic instruction by reinforcing academic skills. Although variability existed among the schools' technical programs, the center's one-year evaluations in English and mathematics showed that integrated instruction was having a positive impact in measures of academic learning.[27]

Structuring CTE within High Schools

High-quality CTE should employ three pedagogical strategies: classroom instruction, work-based learning, and career and technical student organizations.[28] It should also make professional development a priority.

Classroom Instruction. In the classroom, CTE teachers should emphasize contextual learning that teaches students how to apply academic content in a real-world context (for instance, how electricians use algebra to solve job-related problems). According to a report published in 2010 by the National Research Center for Career and Technical Education (NRCCTE) Curriculum Integration Workgroup, the integration of curriculum in CTE should support the understanding of academic *and* technical content. As the authors note, "rigor resides in combining CTE and academic skills as applied to real-world problems."[29]

The NRCCTE has conducted a series of experimental studies of curriculum integration where teams of CTE and academic teachers enhanced existing CTE curriculum to emphasize the underlying academics. The initial study, Math-in-CTE, was the largest and most robust. Researchers working with teams of math and CTE teachers created an enhanced CTE math curriculum and introduced a seven-element pedagogic framework taught by the CTE teacher.

The curriculum and framework were implemented over the course of an academic year in auto technology, health, agriculture, information technology, and business and marketing classrooms.[30]

Even though the experimental students received an average of only 20 hours of enhanced math instruction taught by the CTE teachers, these lessons produced a significant effect. The experimental students scored 9 percent higher than the control students on the TerraNova posttest, a standardized test of basic math and English skills, and 8 percent higher on Accuplacer, a placement test for students enrolling in community college. They also scored higher on WorkKeys, ACT's career-readiness test, but the difference was not statistically significant.

The 20 hours of enhanced math represented just 11 percent of a one-hour class taught for the typical 180 days of a school year. And not all of this time was spent on math, because the math was taught in the workplace context in which it naturally occurred.

Similar results were found in the next study, Authentic Literacy in CTE, but analyses of test data from the final study in this series, which focused on science, showed that science integration works differently from math and literacy integration. Overall, the treatment had no significant impact on students' science achievement. When the researchers disaggregated the data by quartiles based on pretest scores, however, they had an interesting finding: the effects of the treatment were inconsistent across levels of pretest science achievement. That is, the treatment had no effect on posttest science achievement for the lowest-ability students, but it had a substantial positive effect for higher-ability students.[31]

Work-Based Learning. Beyond the classroom, high-quality CTE programs must actively involve employers in the training and education of youth, a strategy called work-based learning. The Organization for Economic Cooperation and Development report *Learning for Jobs* and the Harvard University report *Pathways to Prosperity* describe such involvement as a necessary part of preparing youth for successful adulthood.[32]

Such work-based learning has the potential to build the kinds of skills and behaviors that research is increasingly showing are critical to success in many contexts, including the workplace and college. It is quite clear that learning within a community of professional practice provides students unparalleled opportunities to learn the adult behaviors necessary to succeed in today's workplace and develop the five key skills identified in the SCANS report mentioned earlier—the ability to productively use resources, work with others, acquire and use data, understand complex inter-relationships, and work with a variety of technologies[33]—competencies not easily developed in typical high school classrooms.

To see that work-based learning matters, one only has to look at international comparisons. We know our students do not do well in international comparisons of academic performance.* It is less known, however, that intensive CTE, which includes work-based learning, positively affects key measures of school performance, including attendance rates, high school graduation, and college attendance.[34] In addition, numerous studies show that students who participate in high school work-based learning have improved reading scores, enroll in postsecondary education at levels on par with similar students, and have improved postsecondary achievement.[35]

Career and Technical Student Organizations. In addition to a strong work-based learning component, almost all successful CTE programs have an active student organization. Career and Technical Student Organizations (CTSOs) are cocurricular, with some activities taking place during regular classes and others outside of school hours. Because of their integration of rigorous academic and technical content and their focus on career preparation, CTSOs complement many elements of the Programs of Study required under the 2006 reauthorization of the Perkins Act.

High-quality CTE should emphasize classroom instruction, work-based learning, career and technical student organizations, and professional development.

At least nine CTSOs are recognized at the secondary level by the U.S. Department of Education, serving more than 2 million students in a variety of programs, such as agriculture, skilled trades, business, health, and information technology.[36] CTSOs have been a part of CTE since the passage of the Smith-Hughes Act of 1917. Over the course of the last 90 years, CTSOs have developed numerous activities—such as skills contests, community service, and leadership development—to improve their members' leadership skills, career and technical knowledge and skills, personal characteristics, and employability skills. CTSOs exist within CTE high school programs and are facilitated by a teacher-adviser. Through chapter activities such as running for office, officer training, competitions, and service learning, CTSOs provide students with individual and cooperative activities designed to expand leadership and job-related skills in their fields.[37]

Students also learn skills related to specific occupations and develop their technical literacy through exposure to the general concepts of their chosen fields. Some of the positive experiences identified by CTSO members involve teamwork, decision making, competition, leadership, community awareness, career awareness, and personal and social development.[38] A national study by the NRCCTE found that, compared with comparable students not enrolled in CTSOs, CTSO participants reported higher academic

*For more on international comparisons, see "Soaring Systems: High Flyers All Have Equitable Funding, Shared Curriculum, and Quality Teaching" in the Winter 2010–2011 issue of *American Educator*, available at www.aft.org/pdfs/americaneducator/winter1011/DarlingHammond.pdf.

motivation, academic engagement, career self-efficacy, and college aspirations.[39]

Professional Development. Extensive and ongoing professional development is an important component of delivering world-class curricula. The NRCCTE's research on math and literacy integration found that CTE teachers were able to teach embedded academics but faced a steep learning curve in doing so. This is because many CTE teachers have strong technical expertise but do not have the teaching backgrounds to deliver academic course content without the necessary training and support. Not surprisingly, the more exposure CTE teachers had to high-quality professional development, the better their students performed.[40]

Drawing from the several overlapping definitions of college and career readiness, it seems reasonable to define a world-class curriculum for occupational education as one that ensures students can continue learning beyond high school, acquire the noncognitive work-readiness skills employers demand, and develop specific technical skills that lead to real job opportunities—especially for the majority of youth who will not acquire a formal two- or four-year college degree.

Academics offer essential workplace knowledge and skills. A linear equation is simply a tool, like a torque wrench; both are useful in the workplace.

The NRCCTE's work on curriculum integration suggests the following are important principles to facilitating integrated, contextual teaching—embedding academic content into technical courses—and are part of what CTE teachers should strive to do:[41]

1. Develop and sustain a community of practice among teachers. Unlike other approaches, the communities of practice formed in the NRCCTE's professional development models are centered around the occupational context of the programs, transcend schools and school districts, and include technical and academic teachers.
2. Understand that academics offer essential workplace knowledge and skills. A linear equation is simply a tool, like a torque wrench; both are useful in the workplace.
3. Maximize the academics in the occupational curriculum. The NRCCTE has operationalized this as teaching and reteaching the underlying academic knowledge and skills when they arise in the technical curriculum.
4. Recognize that teachers in the occupationally oriented courses are not academic teachers but teachers of academics in context (e.g., a business teacher teaches writing in the context of creating business plans).

High-Quality CTE Models

In addition to the work of the NRCCTE, several other organizations have created and implemented versions of high-quality CTE, and several influential organizations and universities have issued white papers detailing the elements they believe are essential for such a program.

For example, the Southern Regional Education Board's High Schools That Work model is developing a series of course sequences with a focus on advanced technical programs, including aerospace engineering, advanced manufacturing, informatics, food and nutritional science, automated materials joining (which is a high-tech version of welding), and clean energy technology.* These four-course sequences are designed to blend learning in mathematics, science, literacy, and technical areas, with a focus on strengthening the habits of mind and behaviors necessary for success in both careers and further education. In a very real sense, these are Advanced Placement–quality courses for students who are technically inclined. These programs share a common set of features, including application-based learning of essential academics; a technical curriculum mapped to the Common Core State Standards; authentic, project-based curricula; and professional development focused on curriculum integration, project-based learning, and teaching to rigorous standards.

The National Academy Foundation (NAF) has also created a model for high-quality CTE in the form of academies, which operate primarily in urban public school districts but are also in suburban and rural communities.† These academies are organized around one of five career themes—finance, hospitality and tourism, information technology, health sciences, and engineering. In addition to core academic courses, students take industry-specific classes related to these themes and participate in work-based learning activities to put their lessons into action. The NAF's academy framework is based on these core principles:

- Personalized learning environments;
- Academic engagement of all students;
- Empowered educators;
- Accountable leaders;
- Engaged communities and youth; and
- An integrated system of high standards, curriculum, instruction, assessment, and supports.

*For more about High Schools That Work, see www.sreb.org/page/1078/high_schools_that_work.html.

†For more about the National Academy Foundation, see www.naf.org/naf-academies.

To become a NAF academy requires substantial commitment on the part of the school district and teachers to hold themselves and their students to high standards, to participate in ongoing professional development, and to adhere to the NAF curriculum, among other rigorous requirements designed to ensure high quality. These include:

- Cross-disciplinary teaching strategies;
- Strong links to industry standards and practices;
- Course objectives that have been validated by industry experts and academy teachers;
- An emphasis on NAF academy teachers working with academic counterparts;
- A project-based learning approach; and
- Professional development.

As a final example, California's Linked Learning initiative, supported by the James Irvine Foundation, is an effort focused on developing career pathways that incorporate challenging academics, demanding technical content, work-based learning, and support services.[‡] Linked Learning shares many characteristics of other programs, including ties to academic and industry standards, a focus on college and career readiness, teacher collaboration, curriculum alignment, and problem- or project-based learning. This model emphasizes work-based learning that is designed to link rigorous academics with real-world professions, with an emphasis on the transition to college. Student support services, like individual counseling and supplemental instruction in math and reading, are a unique component of the Linked Learning approach.

No one can predict the future, especially long-term labor market needs. To ensure that all youth have the opportunity to be successful adults, public education must do more than ensure high school graduates can pass tests. Clearly, there are many pathways to future success. Some involve traditional college pathways, but many others involve alternate but equally rigorous pathways through apprenticeships, community college programs, the military, unions, and industry-based training.

These pathways must begin with high-quality career and technical education. Beyond the research shared here, many national organizations have offered policy or advocacy papers in support of a renewed focus on CTE. For example, the College Board and the Georgetown Law Center on Poverty, Inequality, and Public Policy issued a paper in 2013, *The Promise of High-Quality Career and Technical Education*,[42] in which they list a number of characteristics necessary to support high-quality CTE and identify a number of promising models and practices.

In addition, the National Association of State Directors of Career Technical Education Consortium has issued several papers addressing the topic, including *The State of Career Technical Education*, a recent study of how well states are aligning with the Common Career Technical Core, a framework it suggests is necessary for high-quality CTE.[43] And the United Federation of Teachers, in conjunction with the Albert Shanker Institute, rolled out a draft position paper, *A Quality Education for All: A Career and Technical Education Policy Agenda,* during a national CTE conference that included experts from industry, education, and unions.[44] The paper calls for a policy agenda to ensure that all students have access to a high-quality career and technical education.

These organizations, and others too numerous to list here, have come to the conclusion that limiting educational options in high school does not serve the majority of American youth well. ☐

[‡]For more about the Linked Learning model, see www.irvine.org/grantmaking/our-programs/youth/linked-learning.

Endnotes

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